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LAND USE IN THE SILVAN-MONBULK REGION, DANDENONG RANGE, VICTORIA

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Abstract

Employing two different classifications, the land use has been mapped for an area of about 30 square miles focused about Silvan and Monbulk. Explanations have been offered for certain correlations between factors of the environment and patterns of land use. Problems of the area have been analysed from data collected from interviews with landholders.

Introduction

This paper deals with the land use, in 1962, of an complex area on the E. flanks of the Dandenong Ra.

The area surveyed, the Silvan-Monbulk region, is an arbitrarily defined area of approximately 30 square miles. It is bounded on the N. by the Warburton railway line from Mt Evelyn to Wandin North, and thence by the Warburton main road to the Woori Yallock Ck. This creek forms the E. boundary. The S. limits approximate the line of the Kallista-Emerald road. The W. boundary is the Olinda Ck from Mt Evelyn to the Silvan Reservoir, the reservoir, Chalet Rd and a line S. from the Olinda-Monbulk-Mernda Rd to The Patch (Fig. 1). These W. limits approximate the Evelyn Fault and Monbulk Monocline (Edwards 1956).

No previous land use surveys have been made of this area. Because of the limited size but complexity of the area, and the need to map and correlate as many factors of the physical and cultural environment as possible, two different land use surveys were carried out—a unit-area survey and a sectional survey. In the former, by the use of a fractional code, major land use, farming economy, weed cover, weed type, and state of maintenance of farm buildings were recorded in the numerator while slope, drainage, cultivation practices, and degree and type of soil erosion were recorded in the denominator. In the sectional survey, a detailed breakdown of varieties of land use was mapped. (Copies of maps and land use classifications are filed in the Department of Geography, University of Melbourne.)

The field work was carried out in May and June 1962 by 3rd-year students of the Melbourne University Geography Department under the direction of the senior author. Direct field-by-field mapping of land use was recorded on base maps at a scale of 1 in. to 10 ch. of the Dandenong Ra. Area, Sheets 4-6, 10-12, 16-17, 22 and 23. Vertical air photographs, flown in 1961 and enlarged to 1 in. to 10 ch., also were used, boundaries being corrected where necessary and brought up to date. In non-urban areas a census of farms was attempted to collect data about history, farm management, crops, yields, costs, and problems. In some areas, absenteeism and pressure of time resulted in more restrieted sampling. In such cases, as broad and characteristic a sample as possible was then selected. Interviews were conducted on about 75% of the 400 odd rural holdings visited; another 5% was excluded due to the owner or occupier being unable or unwilling to co-operate, frequently because of language difficulties, or to the farmer being absent at off-the-farm work.

In urban areas, a census was taken of commercial and servicing enterprises and restricted interviews, a 5% sample, were conducted with urban residential landowners.

Geology and Surface Relief

The area is essentially a low-lying erosional basin, although portions of the higher N. and E. flanks of the Dandenong Ra. have been included near Monbulk; it forms the W. third of the larger Woori Yallock Basin (Gregory 1912, Easton 1908, Edwards 1940), and is well protected from the W. and S. by the 1,400-2,000 ft high Dandenong Ra. Approximately two-thirds of the area is characterized by a series of narrow, undulating, basalt ridges, ranging in altitude from 600-900 ft, separated by wider valleys that are some 200 ft lower. This basalt area is found in a broad triangle with its base from N. of Silvan to Monbulk and its apex near Seville (Easton 1908). Flanking areas developed on the easily eroded Silurian sedimentary rocks to the N. and E. are lower (300-600 ft) and more undulating with wider valleys and rounded ridges. Steep slopes and altitudes from 800-1,100 ft occur on the S. margins at The Patch where resistant Devonian Middle Dacites occur (Edwards 1956). Maximum altitudes from 1,000-1,500 ft and steep slopes are found to the W. of Monbulk on Upper Dacite rocks (Edwards 1956) (Fig. 1).

The main streams flow northwards. Both the Olinda and Woori Yallock Ck originated respectively as a W. and an E. lateral stream to the Tertiary Older Basalt flow that infilled the valleys across the Basin floor during the Oligocene (Edwards 1940). The present landforms are the result of this inversion of relief with basalt residuals remaining as cappings on the ridges between the valleys. Both the Warburton road and railway from Mt Evelyn make use of a lower area, cut in the Palaeozoic sedimentaries, thus avoiding the generally concordant basalt-capped areas to the N. and S.

Vegetation

Dry sclerophyll forest dominated by several different species of *Eucalyptus* formerly covered most of the area. *Eucalyptus obliqua-E. radiata* association is found on the well-structured, deep, red loams derived from basalt. Trees are dense and tall (over 70 ft) with a three-tiered understorey up to 10-12 ft high. A lower, more open *E. radiata-E. elaeophora* association occurs on the podzols formed on the Silurian sedimentary rocks. Harsh, sclerophyllous shrubs form a dense, 4-6 ft-high understorey. *E. ovata* is found on ill drained, poorly aerated soils, where rainfall is less than 40 in. such as along the Woori Yallock Ck. *E. goniocalyx* is found in a few sheltered valleys on krasnozem soils, notably along Sassafras Ck where *E. regnans* also occurs on deep alluvial soils where rainfall is in excess of 50 in.

Forested areas, largely secondary in nature, serve an important function to agriculture as windbreaks, by reducing runoff, and by slowing down exploitation.

Climate

The humid, mesothermal (Cfb) climate of the Silvan-Monbulk region, though essentially similar to Melbourne's climate (Gentilli 1948, Leeper 1955), has differences due to altitude and local relief. There is an increase in rainfall and a corresponding decrease in temperature with altitude (Table 1). Average annual temperature at Silvan (850 ft) is 4-5°F cooler than at Melbourne (114 ft), while Sassafras (1,400 ft), outside the area to the W., is approximately 10°F cooler. Mean annual precipitation at Sassafras is double that of Melbourne, falling on only one-third

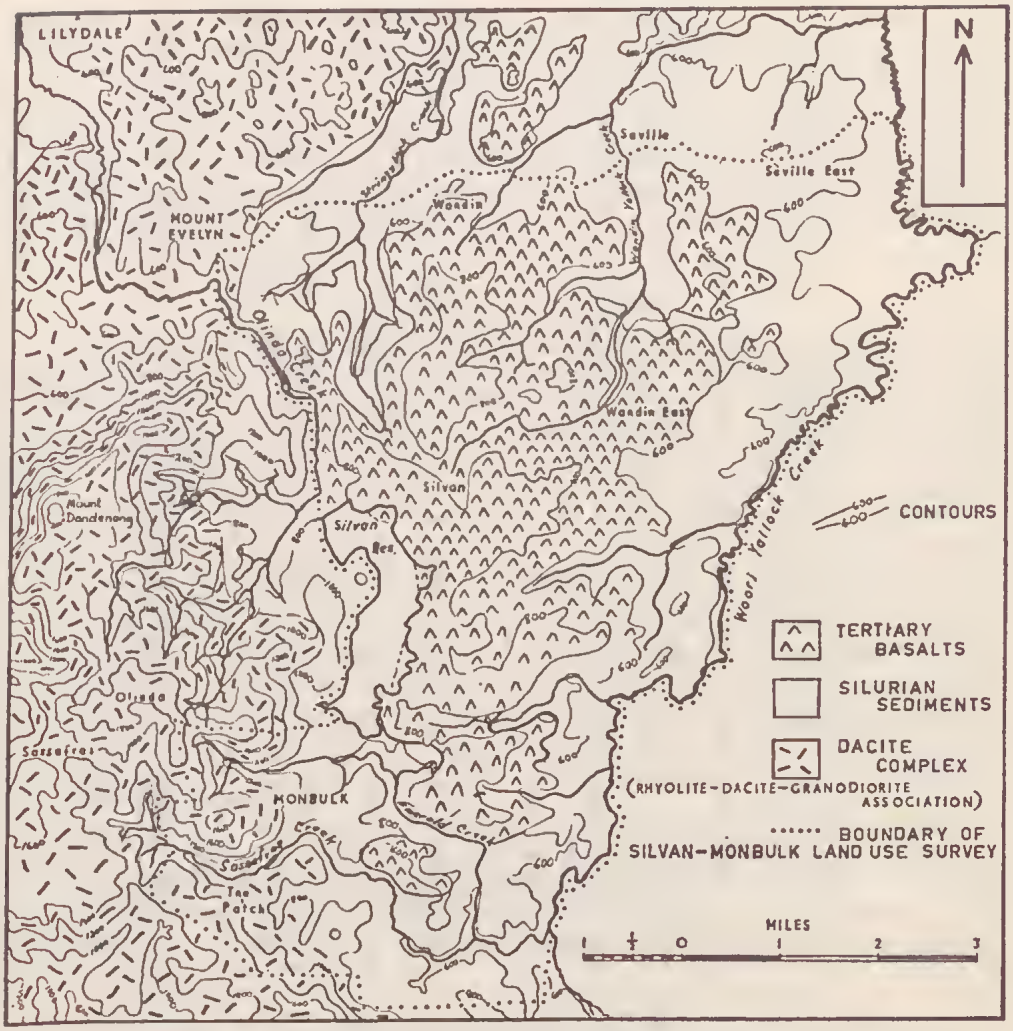

FIG. 1—Geological and locational map of the Silvan-Monbulk Region and adjacent areas.

more rain days. This closely parallels conditions observed in the Mt Lofty Ra. of South Australia (Trumble 1939, Cochrane 1963).

Mean annual precipitation is 40-42 in. increasing to 50 in. in the higher SW. area. Frequent mists and cloud-drip considerably enhance effective precipitation on the higher slopes to the W. and S. of Monbulk. Because of low average monthly rainfall from December to March, combined with high summer temperatures, and a high rate of evaporation, irrigation of summer crops is often necessary for optimum yields on the free draining, basaltic soils. Except for these three summer months, however, the Transeau Ratio (P/E) does not fall below 0·33 throughout the year (Clifford 1953, Leeper 1955). One localized modification of the hot, dry summer occurs in the immediate vicinity of the Silvan Reservoir where slightly cooler, moister

TABLE 1
Comparative Climatological Data

Station	Data	J	F	M	A	M	J	J	A	S	O	N	D	Year
Silvan	Rainfall (pts), 48-yr mean	248	263	290	403	408	470	417	408	397	474	342	323	4390
	No. of rain days, 5-yr mean	8	11	13	14	19	16	24	19	19	18	16	14	191
Stations near area: Sassafras	Rainfall (pts), 36-yr mean	315	316	385	464	464	525	468	450	444	524	413	378	5146
Scoresby (8 miles W.)	Rainfall (pts), 13-yr mean	157	268	204	318	419	274	328	321	406	442	410	298	3845
	Mean temperature, °F, 8-yr mean to 1955	66·4	65·4	63·0	57·2	52·1	48·2	47·7	49·5	52·8	55·9	58·3	62·9	56·6
	Mean total sunshine hrs	269	196	209	135	103	75	100	126	152	181	188	271	2005
Station beyond area: Melbourne (20 miles W.)	Rainfall (pts), 50-yr mean	187	207	216	217	214	207	198	196	233	269	245	238	2627
	Rain days	8	8	10	13	15	15	16	17	15	15	13	11	156
	Mean temperature °F, 30-yr mean	67·3	68·3	65·1	59·3	54·5	50·3	49·4	51·2	54·7	58·3	61·5	65·3	58·8

conditions have favoured the development of tulip growing, notably the harvesting of bulbs during January to March.

Detailed climatic figures for temperature and any figures for humidity, sunshine hours, and frost incidence are not available for the region, but figures intermediate between those of Melbourne and Sassafras can be assumed. Ground frosts occur frequently between February and October, particularly in small cleared areas and where air drainage occurs. Snowfalls have been recorded infrequently from May-October, chiefly to the W. of the area in the high portions of the Dandenong Ra. (Commonwealth Bureau Meteorology 1958).

Brief History of Settlement

From the early 1850's timber splitters entered surrounding forested areas to supply the needs of railways, piers and bridges. In 1867 the 'Dandenong and Woori Yallock State Forest' was set aside as a reserve. The Parish of Monbulk was opened for selection in 1893, and potatoes, market garden produce, and raspberries were quickly established on small cleared portions of the 10-acre selections. Daniel Camm established a jam factory at Monbulk in 1909, the Monbulk Co-operative Fruitgrowers' Association pre-dating it by 12 years. Subdivision quickened after the First World War, and to an even greater extent after 1945. Where urban use has replaced agricultural land use this does not necessarily indicate an unsuitable climate or soil, but simply the fact that the land has become too valuable to be farmed; it became more profitable to sell it unimproved, particularly as the demand for building blocks increased with the 'urban sprawl' eastwards from the metropolis. The building of 'hills' homes for business men and retired folk has been particularly popular in an arc of high land from Monbulk to The Patch (Fig. 7). The decentralization of light industry to the Dandenongs area in the last 10 years has played an important part, and the recent electrification of the railway as far as Belgrave (1962) has encouraged commuting.

In spite of this, the natural advantages of the area are such that specialized enterprises such as berry fruit growing will remain and expand providing production can be intensified and returns increased (Avent 1954-60).

The Town Planning Board's Interim Development Order of 1959 has 'frozen' subdivision in, e.g. The Patch, awaiting detailed studies and land use zoning (Coulson 1959).

Farm Size and Tenure

The acreage of individual holdings varies considerably; while property sites in the urban centres, Monbulk, Mt Evelyn, The Patch, Seville, Wandin, and Seville East are by their very nature small, the farms range from a fraction of an acre to over 300 acres, and in at least one case to 500 acres. There is, however, no significant overall parallel between farm size and geographic location. Diversification of production, and an increased percentage of farm area given over to grazing typify the larger properties. Conversely, the smaller the property, the more intensive the enterprise, and generally speaking, the greater is the extent of well-structured red loams capable of sustained cultivation for vegetables and berries (Pl. XLVI). For this reason a farm with sheep and cattle grazing, grain crops, orchards, and berries, totalling 120 acres, is found only 200 yards away from a 4-acre holding devoted solely to vegetables.

The area as a whole produces 97% of the total Victorian berry fruit output,

and the mean property size of 356 growers, with more than half an acre under berries, is 29·1 acres (Bureau Agricultural Economics 1962).

The 10-acre selections made available by subdivision around 1900 account in part for the smallness of many present holdings. Subsequent engrossment, necessary for economic farming, has been more than balanced around developing service centres by more recent fragmentation and urban subdivision.

Although a few smaller properties are rented, tenure is largely freehold, and

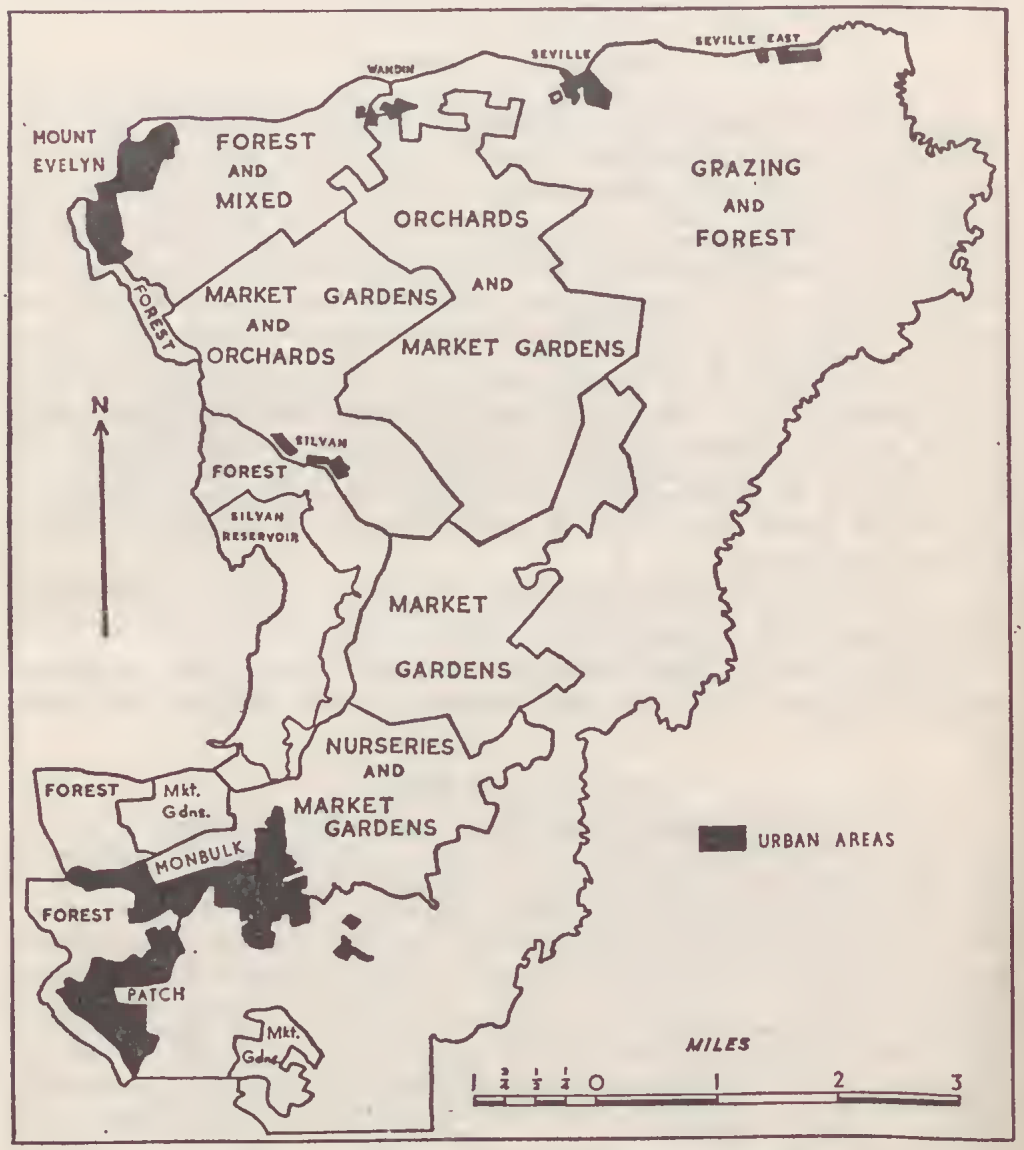

FIG. 2—Predominant land use areas of the Silvan-Monbulk Region, June 1962.

occupancy ranges from the time of the original sub-division 70-80 years ago, to a matter of 2-3 years or less where small, uneconomic market gardens have changed hands several times in the last 10 years. The inexperience and lack of working capital of some settlers has been an important stimulus to this recent turnover. Some small market gardens are rented, and others are worked by absentee 'weekend farmers'.

Nature and Intensity of Land Utilization

The Silvan-Monbulk region exhibits a great range in degree of exploitation, from virgin selerophyll forest, through newly and partially cleared areas, through rough, and improved grazing, and orchards, to intensive berry fruit growing and market gardening (Fig. 2, Pl. XLVI). Though not strictly definable in terms of soil type, the gradation in rural land use falls into three major categories: (1) Vegetables, berries, bulbs and small stone fruit orchards on deep red loam soils of the basaltic tongue through the centre of the region, from Wandin and Silvan to Monbulk (Fig. 5, 6, 8) and to a lesser extent on the krasnozems to the W. and S. of Monbulk where root vegetables (Fig. 7) and ornamental nurseries are found (Fig. 5). Some large stone fruit orchards are also found on prosperous, long-established holdings between Silvan and Wandin East (Fig. 6). (2) Scrub and grazing interspersed with pome fruit orchards and vines predominate on the grey podzols of the lower areas between 300-700 ft elevation, near Seville in the N. and flanking the Woori Yallock Ck in the E. (Fig. 4). (3) Partly cleared and forest areas, grazing, large orchards (often not fully mature) and a greater percentage of mixed farming occur in areas flanking or astride both the red loams and the grey podzols (Fig. 5, 8). There is a broad correlation between geology, soil type, farm enterprise, and property size (Cf. Fig. 1-8).

The differentiation between various types of farm enterprise is most marked in the case of market gardening. Most market gardeners, and a smaller percentage of berry fruit growers, depend solely on this one form of land use for income (Summerhayes 1958). This is closely related to the need for intensive application of capital and labour. On the other hand, fewer properties are given over solely to orchards. Even though orchards may provide the major income, there is a tendency for a diversity of production covering grazing, poultry, pigs, and berries; such diversification allows a more economic spread of labour and of machinery. It also caters for different soil capabilities and relief—particularly aspect (Fig. 1, 5, 8), and, while labour and capital inputs vary, there is some measure of insurance against the failure of any one income source. On the other hand, the area exhibits examples in which each of the above is the sole enterprise on certain farms (Pl. XLVI). This monoculture is successful on some properties, though with orchards there is usually a variety of trees if not in enterprise, and if berries alone are grown, an alternative income source must normally be found for the winter months, such as outside work in factories or as hired labour on larger properties (Avent 1954-60, Summerhayes 1958).

Within the Silvan-Monbulk region, as for Evelyn County as a whole (Comm. Bur. Cen. Stats Viet. 1962, Bur. Ag. Econ. 1962) apples, cherries, non-canning pears, lemons and limes, non-canning peaches, and plums, in order, were found to be the principal orchard fruit. Strawberries and raspberries predominate in berry production. Strawberry crops are the most important source of income within the area. Loganberries, youngberries, boysenberries, lawsonberries, and gooseberries are also grown. Plant nurseries (Fig. 2, 5) produce tulips, hyacinths, daffodils, gladioli,

Canadian pines for the Christmas-tree market, and large numbers of fruit trees for orchardists and Melbourne home gardeners. Potatoes are by far the most important vegetable in both acreage and production, though there is a multitude of others, such as carrots, peas, beans, tomatoes, celery, cauliflower, Brussels sprouts, broccoli, sweet corn, and chilis or capsicums. In terms of livestock there are ten times more sheep and fat lambs than cattle or pigs slaughtered for human consumption; there are more dairy than beef cattle or pigs. Four times as much land is under pasture as under crop in the Evelyn County; the ratio is less than 2:1 in the Silvan-Monbulk region. Oats is the principal cereal for grazing and hay.

While the large-scale maps (Fig. 3-8) should be studied for details of land use in June 1962, the broad pattern is shown in Table 2.

TABLE 2

The Varied Pattern of Land Use

(Based on 5 sample areas of 500 acres each)

Relative position in survey area	Areal % given to—							
	Forest/ scrub/ recently cleared	Grazing	Berry fruit crops from vines/ canes	Bulbs	Market garden	Orchards	Urban	Other
NW. (nr Evelyn)	42	11	2	–	–	6	–	39
NE. (nr Seville)	7	80	–	–	2	8	1	2
E. Central (Wandin East)	16	18	–	–	33	22	–	11
W. Central (nr Silvan Res.)	32	1	4	3	5	11	–	44
SW. (nr Monbulk)	30	6	3	3	7	2	21	28

Within the limitations of any generalized presentation of land use, Table 2 indicates at least a minimal geographic differentiation: grazing is more important in the N. and the E. (Fig. 4); berry fruit crops from vines, and bulbs are important in the moister W. centre and S. (Fig. 5, 6); orchards are comparatively evenly distributed N. to S., though more important in the centre (Fig. 6, 8), and less important off the loams to the S. near Monbulk (Fig. 7); and market gardens are common on the E. and S. within the 'basalt triangle' (Fig. 5, 6). The area off the basalt, in the NW. near Mt Evelyn, is largely forested and is characterized by very mixed land use (Fig. 8); it is an economically marginal area containing numerous, small, sub-economic, part-time farm units. It must also be borne in mind that areal dominance does not necessarily mean economic nor even productive dominance, in fact the reverse may often be true, and bulb growing near Silvan would be a case in point.

Country of Origin, Length of Occupance, Farm Type

Data were collected on the country of origin (nationality) of the occupiers of 211 properties, approximately half of those in the area surveyed. Table 3 compares country of origin with type of soil worked. While this appears to have some significance, the parallel must not be developed too far. Because of the random

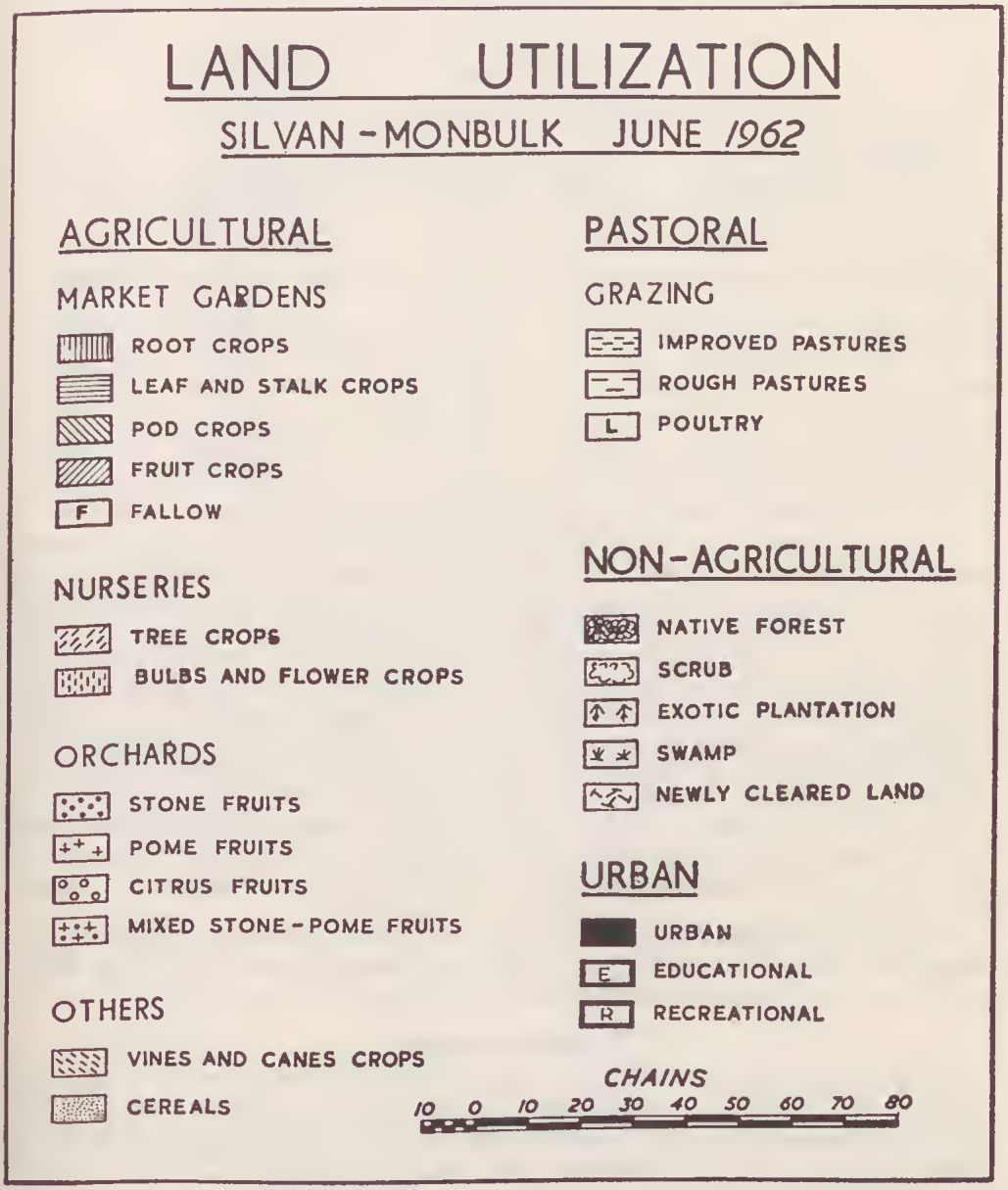

FIG. 3—Key for detailed land utilization maps shown in Fig. 4-8.

sampling involved, no final conclusions can be drawn, but it seems clear that Australians and Italians predominate, the former being more numerous in every case except on the poorer, solely podzols holdings. Prior occupancy would account for this in most instances. The parallel, already mentioned, between nature of farm enterprise and soil type, should be borne in mind.

TABLE 3

Country of Origin: Farm Soil Type

(211 Properties)

Farm soil type	% of total by country of origin of occupier				Total %
	Australia	Italy	Holland	Other European Countries	
Basaltic red loam	15·4	12·0	—	0·9	28·3
Podzols	0·5	2·8	0·5	0·5	4·3
Basalt/podzol transition	24·6	17·5	6·6	9·5	58·2
Krasnozem (The Patch)	24·6	17·5	6·6	9·5	58·2
Total %	47·6	32·3	9·0	10·9	99·8

The Australians, even if not descendants of the original settlers, have usually been on the land for a considerable time. In most cases other national groups are more recent arrivals, particularly during the last 10 years. While Australians practise all types of farming, the Italians are almost solely market gardeners (hence their importance on the red loam areas) and family labour, usually unpaid, is a feature. A number of the Italians have no previous farming experience, and no scientific horticultural knowledge, so off-the-farm work is essential to augment farm income; the Monbulk jam factory is one common avenue. Soil exploitation and decline in fertility are the frequent consequence, yet, as with other nationalities, individuals more adaptable and willing to learn and experiment are reasonably successful.

The Dutch are mainly involved in the nursery business, especially tulips and bulb growing, and, because of the moister conditions required, they are found in the vicinity of the Silvan dam (Fig. 5, 6), and on the deep dacite krasnozems around The Patch (Fig. 7).

The other European migrant farmers, such as Poles, Greeks, Yugoslavs, and Hungarians, seem on the whole to be more experienced and to be making better adjustments to Victorian conditions than the Italians.

Costs and Rewards

Although this report is not concerned to give a detailed analysis of the farming economy, data collected make it possible to tabulate costs, returns, and yields that may be taken as typical (if not precisely average) of the area in question; these are presented as general costs (Table 4), and a more detailed breakdown of certain aspects of production (Table 6).

TABLE 4

General Costs

			Unit	Cost or payment	Comments
1	TREES, PLANTS, BULBS, ETC.	Strawberry runners	1000	£12/10/-	Ag. Dept (Toolangi)
		,, ,,	,,	£7/10/-	Growers' Assocn concession
		Cherry trees	100	£17/10/-	3/6 ea.
		Apples trees	,,	,,	,,
		Peach trees	,,	,,	,,
		Citrus trees	,,	£90	18/- ea.
		Bulbs	acre	£2,000	Approx. 100,000/acre (Hyacinths, Tulips*)
2	LABOUR	Strawberry picking	lb	8d	A good day 100 lb (£3/15/-)
		Orchard work	hour	7/6 to 8/6	Seasonal labour
		Cherry picking	case	12/- to 14/-	Seasonal labour
		Nursery labour	week	£20	Unskilled
3	TRANSPORT	Berries to market	15%	3/6 per £1	Transport commission
	CONTRACT RATES, ETC.	Ploughing	day	£30	Tractor and plough
		Dam construction	day	£80	Bulldozer
		Clearing	acre	£80-100	Bulldozer
		Channel water	1000 gals	2/-	
4	LAND	Near Monbulk	acre	£600	Approx. only, depends on position, condition, etc.
		Near Silvan	acre	£300-£350	

* Tulips, formerly imported from Holland, are now prohibited in large numbers by quarantine regulations.

TABLE 5

Fertilizers: A Sample Survey

Crop	Fertilizer	Amount per acre (usually spring topdressed)	Cost/ton
Youngberries	B & B[1]	15 cwt	£20–24
,,	2·2·1 c.m.[2]	18 cwt	£24 11 0
Loganberries	5·2·1 c.m.	7 cwt	£20 7 0
Gooseberries	B & B	10 cwt	
	Potash	3 cwt	
Berry fruits	5·1·1 c.m.	7 cwt[3]	£18 15 0
Carrots	5·2·1 c.m.	10–12 cwt	
Potatoes	,,	15 cwt	[4] £20 7 0
Tomatoes	,,	5 cwt	
Beans	,,	2–5 cwt	
Broccoli, sprouts	2·2·1 c.m.	8–20 cwt	£24 11 0
Pasture	2·2·1 c.m.	Autumn 3–5 cwt	£24 11 0
Orchards	2·2·1 c.m.	4–5 lb	£25 5 0
	1·1·1 c.m.	6 cwt	
Cherries	2·2·1 c.m.	10 cwt	£24 11 0
Citrus	2·2·1 c.m.	5–8 cwt	£24 11 0

[1] Blood and bone; [2] Complete manure; [3] Recommendation by Ag. Dept;
[4] 10 cwt/acre is Ag. Dept recommendation.

Table 4 is by no means exhaustive but the wide scope of the report, together with the restricted time in the field, made it impracticable to seek more detailed data. In particular, there was no attempt at property or plant and machinery valuation, nor at an economic analysis of the relative importance of paid and unpaid labour. Some of these aspects are discussed in Bur. Ag. Econ. (1962). On the other hand, overall labour costs are not great when it is realized that there is very little permanent hired labour, even less casual labour. Picking labour does constitute a considerable expense during the particular harvest season, and in some cases reaches a third of total production costs. Fertilizer costs are next in importance, providing at least a tenth of total costs for more intensive types of farming (market gardens and berry growing), less for orchards, and at a minimum for pastures.

Table 5 indicates that, in a number of cases, fertilizer applications are heavier than those normally suggested by the Victorian Department of Agriculture extension officers. This is warranted in a few examples of unusually serious soil depletion, but very often the amounts now used are arbitrary or approximate; some farmers, principally new Australians, have no contact with departmental officers, and use inadequate amounts of fertilizer, while in other instances the one formula has been applied for a number of years despite changing soil needs, such as increasing potassium deficiency. As far as actual costs are concerned, the price per ton is fairly stable and uniform; prices are reduced 26/- per ton if the buyers' bags are used, or by 34/- per ton if delivered in bulk. A number of farmers indicated that they did not know that advice was available from agricultural department officers on such matters.

TABLE 6

Production Costs: Silvan Area

Yield per acre	Beans		Carrots	Strawberries	
	100 bags*	200 bags	500 cases*	1 ton	4 tons
Plants/seed	£3	£3	£5	£13	£13
Fertilizer	12	12	12–16	12	12
Labour	30	35	15	100	110
Picking	50	100	125	75	300
Marketing	19	37	60	42	168
Depreciation	10	10	—	10	10
Interest on capital	20	20	—	20	20
Rates	2	2	—	2	2
Insurance	3	3	—	3	3
Sundries	10	10	10	62	113
Total cost	£159	£232	£230	£339	£751
Cost per unit	£1/11/10	£1/3/8	9/3	£339	£187/15/–

* Bag = 1 bushel; case 1⅓ bushels.

A large number of vegetable and berry growers rely on agents for transport and marketing; others, notably the farmers with very large properties, generally provide their own transport. Approximately half the orchardists and three-quarters of the market gardeners sell market produce through agents on a 15% commission. Of the three market channels, roadside, local factory, and Melbourne, only the latter is catered for by agents at the uniform rate. Most high-grade produce is marketed

TABLE 7

Average Profits on Carrots: Silvan Area

Market price/case	Production cost/acre	Market price (500 cases)	Profit
8/–	£200	£200	£ –
16/–	230	400	170
£1	245	500	255
£2	320	1,000	680
£3	395	1,500	1,105

at Melbourne with second quality fruit going to local processors, the ratio between the two depending on Melbourne prices. The Victorian State Government and the Melbourne City Council enforce marketing regulations at the Victoria Market. Growers' organizations do not exercise supervision over producers and agents.

Table 7 gives details of financial returns over the last 2-3 seasons for carrots (de Vaus 1962). Although this table indicates the possibility of profits of up to £1,000/acre, the market price in early 1963 was only of the order of 16/-, and during the 1961-62 season frequently fell below 10/-. A similar comment would apply to many of the returns listed in Table 8.

Yields

It is relevant at this stage, while discussing economic rewards, to tabulate typical yields produced over the last 2-3 seasons for the more common crops in this area.

The range in yields cited is primarily an indication of year-to-year fluctuation. Nevertheless, such factors as better management, or more suitable soils, may mean

TABLE 8

Returns: Wandin-Monbulk

Crop	Unit	Grower's return	Comment
Tomatoes	bushel	8/–	
Carrots	case (1⅓ bush.)	10/– to 50/–	
Beans	bushel	45/–	£105/ton
Peas	bushel	30/–	(48 lb bags)
Potatoes	3-bushel	40/–	eating
	3-bushel	50/–	certified seed
	acre	£140-150	
Lemons	bushel	10/– to 20/–	
Plums	,,	18/– to 28/–	Victoria Market
	ton	£22-25	poorer grades
Apples	bushel	10/– to 15/–	
Cherries	,,	24/– to 30/–	40/– maximum
Strawberries	lb	1/11 to 2/6	inferior; to cannery
	,,	3/6	marketed by grower
	,,	2/9	marketed by agent
Other berries	,,	10d to 1/2	10d jam fruit, 1/2 canning fruit
Tulips (flowers)	doz	6/–	Melbourne and roadside
Bulbs	1000	£25-30	tulip, hyacinth,
	,,	£7-10	gladioli
Firewood	ton	£2	after clearing

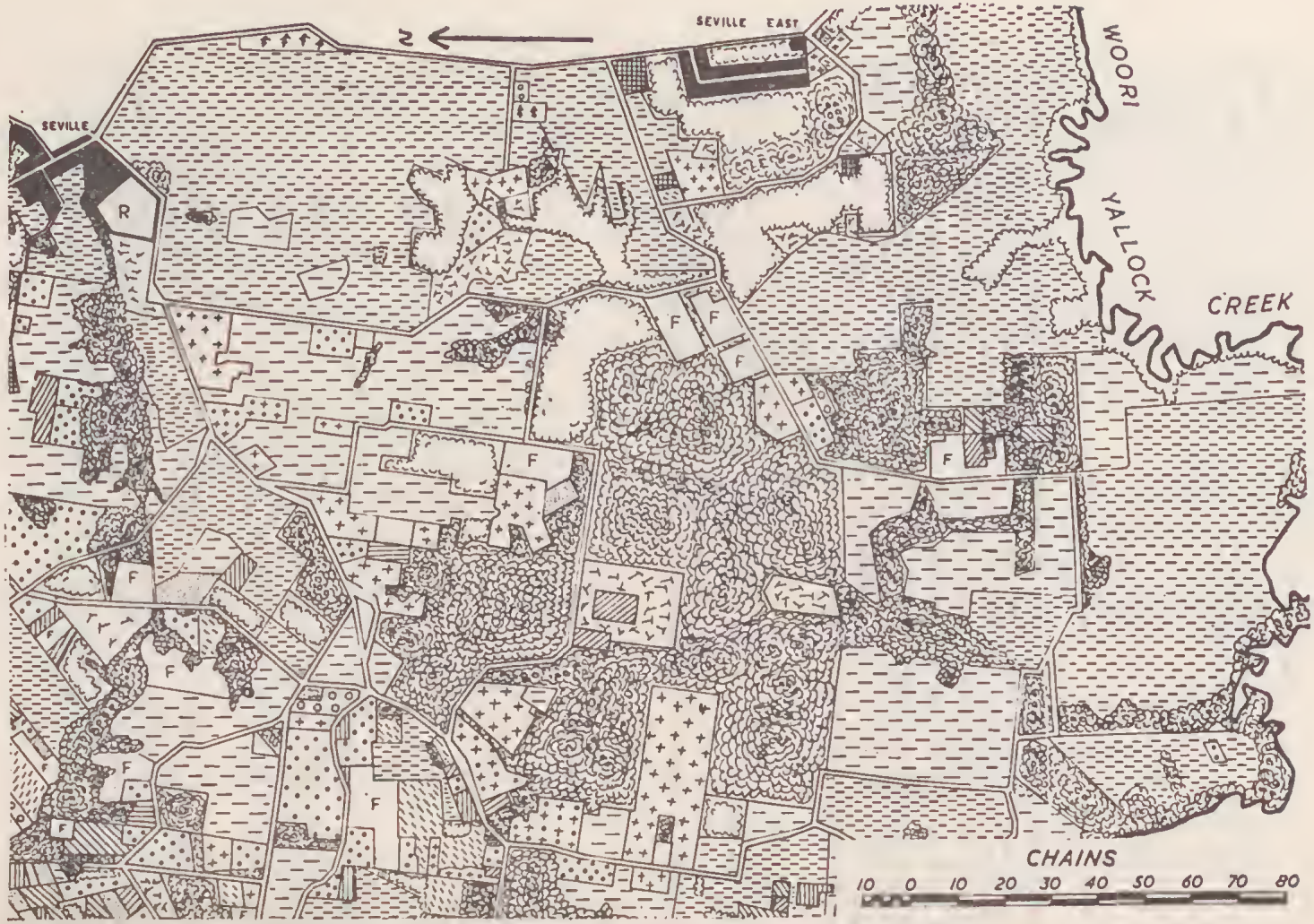

FIG. 4—Detailed land utilization map, June 1962, of the NE. of the Silvan-Monbulk region in the '*predominantly grazing and forest area*'. *See Fig. 3 for explanation of* symbols.

TABLE 9

Crop Yields 1960-2: Silvan-Monbulk Region

Crop	Yield
Tomatoes	800-900 bushels/acre
Carrots	1000 „ „
Beans	150–200 „ „
Potatoes	4–6 tons/acre
Lemons	3 bushels/tree
Plums	6½ „ „
Apples	4–5 „ „
Cherries	4 „ „
Berry fruit	1–2 tons/acre

higher yields on individual farms, e.g. while the Victorian average potato yield (1961-62) was 5·38 tons/acre, a farm on basaltic soil N. of Silvan harvested 7·5 tons/acre. Similarly, a marked increase is possible in berry fruit production with the use of specially grown runners provided by the Victorian Department of Agriculture. Current berry yields average ¾-1 ton/acre for strawberries, and just over a ton for raspberries and other berries. Yet this has been raised in some cases to 5 tons/acre with the consistent use of virus-free strawberry runners supplied from Toolangi by the agricultural department. Whether this latter high yield can be maintained over any considerable period has yet to be ascertained.

Problems Associated with Land Use

Environmental Factors

The adequacy of the water supply for farm purposes varies considerably within the Silvan-Monbulk region, and indeed from farm to farm. While the actual gross precipitation would be adequate for all but the most intensive land use (bulb nurseries are particularly demanding in this respect), the cumulative effect of run-off and evaporation means that irrigation is desirable and sometimes necessary for crop production. The steeper slopes of the red loams shed rainfall most readily, but the very nature of this relief hinders the provision of irrigation channels. The Yarra-Silvan conduit which traverses the area NE.-SW. can be drawn on for irrigation of crops at 2/- per 1,000 gallons, but may not be used to water pastures. Permission to irrigate from this source is restricted to properties downslope from the channel to minimize possible contamination from run-off and seepage. The Silvan Reservoir itself is reserved exclusively for Melbourne's domestic water supply network. Some farms, situated on transitional soils, have semi-permanent springs flowing from beneath the basaltic soils, and these are used to fill private dams from which the water is pumped or channelled as required. In most cases these continued to flow even during the dry period of 1961-2. A number of bores, notably NE. of Silvan, have been sunk in an attempt to tap this same water source. The total cost of boring (£800-£1,000 to drill 200 ft, or £500 after rains) would not seem, however, to be justified by the generally unsatisfactory results. Private dams are a more successful alternative, but there are two pre-requisites: a water source, whether run-off, spring, or creek; and a suitable soil. The free-draining basaltic soil is not suitable, although there are a number of dams in transitional areas where there is sufficient impermeable clay to inhibit the escape of water. In areas of podzolic soils, as in the

N. and E., dams must be sunk to considerable depth to minimize downward percolation; concrete construction of dams is the rather expensive alternative, but the two or three examples (all in the N.) have proved difficult to maintain from cracking.

Frosts and even 'cold snaps' cause considerable damage or the complete loss of certain crops. While the frosts are not usually severe, every season sees the loss of some strawberries, peas, beans, and to a lesser extent, orchard fruits. Frosts also affect plant and bulb nurseries E. of Silvan (Fig. 5, 6), but this has been minimized by the use of plastic sheeting. The fact that there are only one or two farmers who use 'smoke pots' would seem to indicate the infrequent occurrence of severe frosts. Severe hail storms, even less frequent, nevertheless cause great losses in all fruits when they do occur. Snowfalls are extremely rare but have marred or completely ruined some farmers' crops within the last 2-3 years.

In summer the combination of hot, dry northerly winds, and a northerly aspect, bring about the burning and withering of market garden and nursery crops; peas and strawberries are particularly prone. In contradistinction such aspects are favourable for the quick drying, during harvesting, of bulbs. Shelter belts are at least a partial answer also. The problem is most serious to the N. of the survey area, the Silvan Reservoir having at least a minimal alleviating influence in the centre and S., though, as mentioned, aspect is more significant than geographic location.

Soil fertility is a common though not universal problem. Even the krasnozems, basaltic or dacitic, are suited to cultivation because of their porous structure rather than their fertility; leaching accentuates the calcium deficiency, and the soil tends to fix phosphorus. In fertilizers recommended for the survey area (e.g. by officers of the Victorian Department of Agriculture, and by Commonwealth Fertilizers & Chemicals Ltd) the ratio of nitrogen, phosphorus and potash is fairly critical, as for all agricultural land. As with many Australian soils there is a notable phosphorus deficiency, but the water-soluble fertilizer superphosphate makes this immedaitely available to plants. Evidence suggests that the potassium deficiency also is becoming more serious in this area E. of the Dandenongs. A number of farmers are at present initiating or increasing the application of potash to counteract declining yields, particularly with orchards on podzolic or transitional soils. Up to 4 cwt/acre of potash as muriate is being applied in orchards.

Soil-slip is a common problem in the steeper areas of the basaltic soils. The red loams become 'greasy' after heavy rains and, if the slope is sufficient, tend to move downhill; the resulting rippling and terracing makes ploughing difficult, and has been known to break fences and, in one case, to undermine a house. Immobilization of such soils is usually a long-term process; some steep sections have been left under natural forest, or grass cover may be used to stabilize the soil. Land use is minimal or postponed indefinitely where soil-slip is serious. Even with moderate slopes, cultivation may be difficult in winter as the soils become slippery.

Erosion, on the other hand, is not a serious problem though with steep slopes, such as those on the N. side of Emerald Ck (Fig. 5), heavy rain after cultivation causes a combination of soil-slip and erosion; in this case recent cultivation is the differentiating and pre-requisite factor. Erosion occurred on some of the longer-established farms due, in the main, to the technique of cultivating in long strips. This has been overcome with the use of shorter furrows, grass strips on headlands, cover crops and inter-cropping, cross-ploughing, contour planting as in orchards, and the now common use of agricultural pipes for subsoil drainage, particularly in the podzolic soils.

Weeds, bracken fern, and blackberries are a common problem; the Sassafras

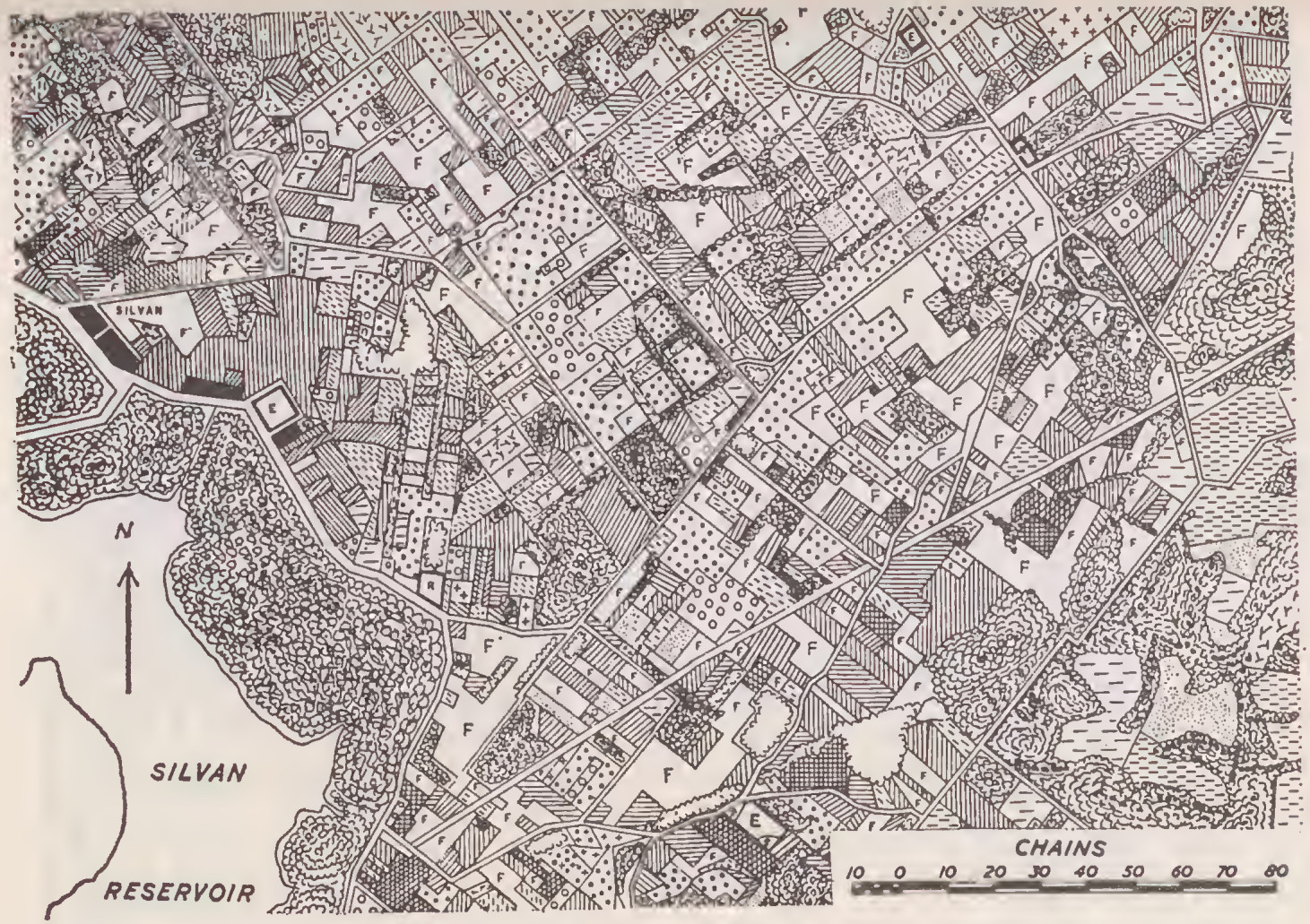

FIG. 5—Detailed land utilization map, June 1962, of the S. centre and the SE. of the Silvan-Monbulk Region. Parts of predominant land use areas shown are: (a) 'forest and grazing', flanking the E. and S.; (b) 'intensive market gardening', N. centre; (c) 'nurseries and market gardening', centre, to the E. and S. of Silvan Reservoir. See Fig. 3 for explanation of symbols.

Ck area is particularly bad in this respect (Fig. 7). The Patch Progress Association led a movement to have the problem attacked on a State-wide basis early in the 1920's. Hormone sprays and formulations like 2-4D are more successful than the original methods of eradication—cutting and burning. Bracken is not as widespread, except in wooded areas, and does not regenerate or spread as rapidly among growing crops on cultivated land as does the blackberry. Water-weed is prevalent on rejected land, and capeweed, Prince of Wales feather, and the wild radish also reach problem proportions.

Lindane, Dieldrin, and D.D.T. are the most commonly used insecticides in this area. Thrip on berries and nursery flowers, and aphis on cherries are particular problems; a number of orchards are sprayed with Bordeaux, and a kerosene weedicide is used at the rate of 40-70 gallons/acre on carrot crops (de Vaus 1956). Rootborer in cherries and other orchard trees is another insect pest.

Virus diseases have hit the growing of strawberries in particular, and even stocks of runners have on occasion had to be burnt. The variety 'Climax' was imported from Scotland, at first with little success, as growers had no method of preservation. The Department of Agriculture has been experimenting recently with several varieties at Toolangi—'Early Cambridge', 'Midland', 'Red Rich', 'Talisman', and 'Healthy Climax'. Such virus-free varieties, kept in cool stores, have enabled a considerable increase in yields, up to 5 tons/acre for 'Red Rich'.

From this brief survey of the environmental or physical problems of land use it can be seen that, while there are a number of difficulties or factors to be taken into account, nevertheless most if not all problems are being successfully combated.

Personal Factors

Most of these have been mentioned already and probably apply to most persons engaged in this particular type of agriculture, at least throughout Victoria. Problems may be summarized as: (a) Lack of knowledge of intensive farming in general, and of market gardening, berry fruit growing, and orcharding under Victorian conditions in particular. This would apply on both the theoretically scientific and experimental levels, and especially, as mentioned previously, to Southern European migrant settlers. On the one hand there is often a complete lack of farm experience of any type and, on the other, a philosophy of 'anything goes'. Migrants' language problems tend to accentuate their isolation both from their Australian neighbours and from field officers available to advise them. Nevertheless, because some new Australian farmers are now, in fact, in regular contact with agricultural department officers (apart from the routine 12-18 monthly visit by the latter), it would seem that an increasing number of those who remain on the land will take advantage of this service. (b) To a lesser and decreasing extent, the lack of scientific farming knowledge applies to many other farmers in this area. A particular instance is the problem of soil fertility and maintenance of yields. Thus, on some older properties, fertilizer applications have not been adjusted for up to 25 years, despite recognized declines in yields and subsequent changes in the farm economy. Over the last 3-4 years, however, there has been an almost universal attack on this problem, and agricultural department officers, as a matter of course, visit all properties. (c) Lack of adequate initial working capital is again a particular problem of new Australian farmers; the prevalence of parallel, off-the-farm work, is one indication of this problem. The combination of inadequate initial capital, minimal farming knowledge, and possible early crop failure, sends a number of farmers back to the industrial suburbs of Melbourne each year.

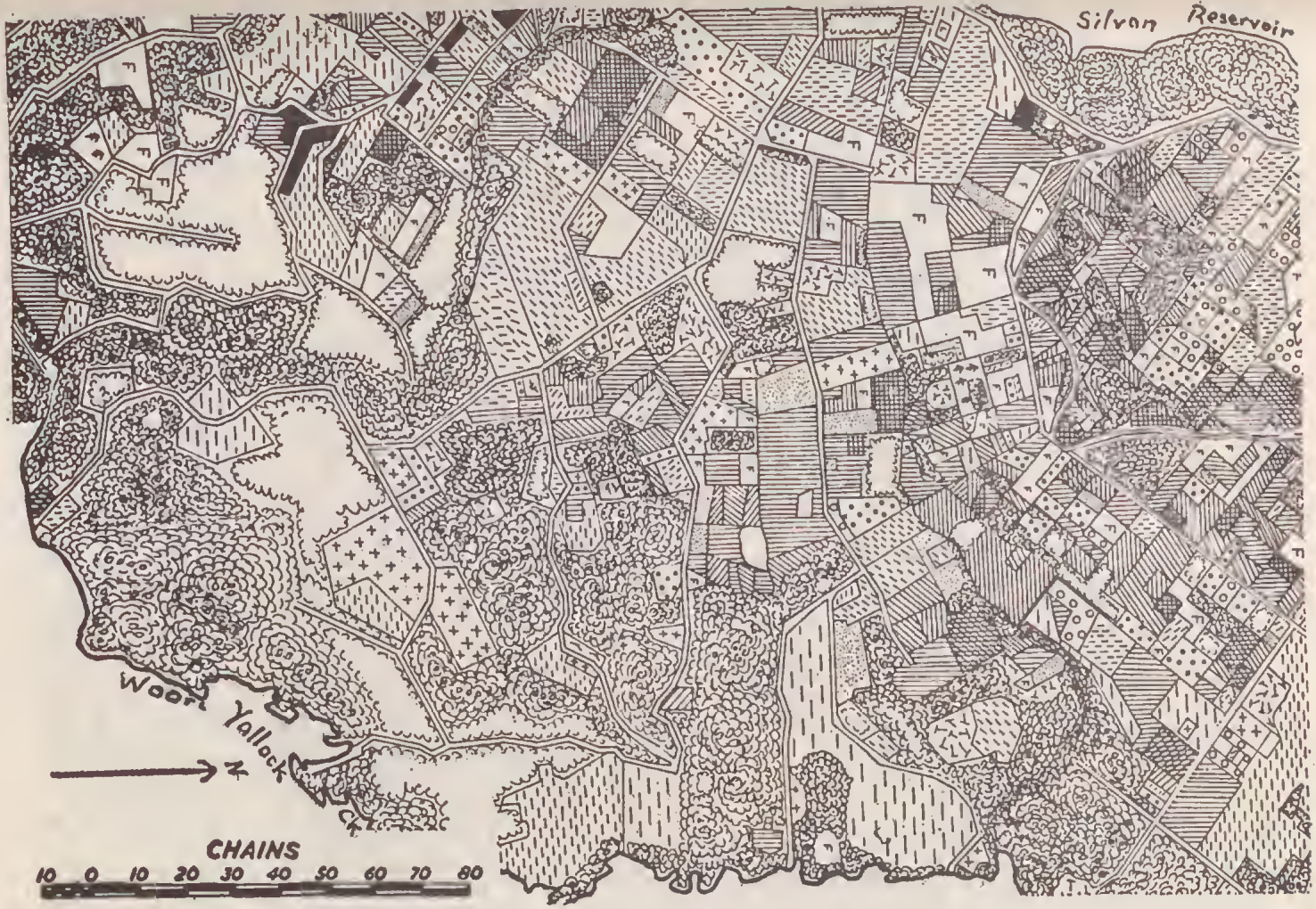

FIG. 6—Detailed land utilization map, June 1962, of the central area of the Silvan-Monbulk Region. Parts of predominant land use areas shown are: (a) 'forest', flanking the Silvan Reservoir; (b) 'market gardens and orchards', N. of Silvan; (c) 'orchard and market gardens', centre; (d) 'grazing and forest', on the E. flank. Note the concentration of berryfruit vines E. of Silvan. See Fig. 3 for explanation of symbols.

Economic Factors

As already pointed out, this paper does not intend to provide a detailed analysis of the economic structure of land utilization, but certain recurring economic problems can at least be outlined:

1. Competition in production and marketing is present in both the local and wider spheres. There is evidence of the existence of the age-old problem of large landholders 'squeezing out' the small (usually single-enterprise) farmers; e.g. berry fruit buyers pay less attention to small market gardeners than to larger mixed-economy farms. It is not clear whether this is a result of the latter being recognized as producing better-quality, more uniform crops. The larger landholders are finding less freedom on interstate markets than in the past, and are being increasingly confined to their home State.

2. Instability of prices is closely related to growing competition and here again more seriously affects the small farmers. Some have stored products such as potatoes, carrots, and lemons until prices rise, and it seems certain that this was the main factor in the change over from the berry fruit predominance of The Patch area 50-60 years ago to its present root-crops emphasis (de Vaus 1956). Also strawberry yields are lower on The Patch soils than at Silvan-Monbulk. Fluctuating prices do not always recoup labour and other costs and the result in both the larger and smaller properties in this area is for a gradual diversification. Some farmers experience intermittent difficulties in selling fruit in particular because they look for higher prices in Melbourne, rather than turning to the easier but less profitable Monbulk Cannery. However, this factory stops buying completely at certain times, so returns, albeit lower, are still by no means assured.

3. Transport of produce by agents on the 15% commission mentioned earlier closely reflects the size of the farm enterprise, only the largest properties finding it economic to provide their own transport. On the other hand, the agents' commission is excessively high due in the main to the lack of competition in this field.

4. Labour and employment: labour costs constitute a difficult problem on the smaller properties, but it is doubtful whether such assistance is usually necessary; the berry fruit industry and market gardening notably place much reliance on unpaid family labour. The readiness of the larger, more diversified farms to employ considerable harvesting (or picking) labour reflects both crop size (too large for mere family labour) and financial ability to pay this labour. This latter fact is due to a combination of higher gross returns, and to the spread of enterprise reinforcing the farm economic structure. The less labour-intensive nature of orcharding is one motivating force in the increasing importance of this form of land use.

The Monbulk Preserves Company, which derives its labour from within approximately an 8-mile radius, provides mainly unskilled work, but is an important supplementary income source for the district. Year-round jam making provides employment for about 120, while the December-April canning period raises factory employment to over 300 (1961-2). Two-thirds of this labour is female. Two shifts are worked in the latter season, and approximately 200 pickers are employed to pick company berries, grown in part for research into varieties. The Melbourne & Metropolitan Board of Works provides employment for many men during winter and seasonal 'off-peak' periods.

5. Subdivision and proximity to the Dandenongs: reference has been made already to the 'urban sprawl' invading this area, closely associated with subdivision and rising land values. This latter factor is also related to the developing tourist industry of the Dandenongs in general. The 1959 Interim Development Order

FIG. 7—Detailed land utilization, June 1962, of the SW. of the Silvan-Monbulk Region. Cf. Fig. 2. Parts of predominant land use areas shown are: (a) 'market gardens; (b) nurseries and market gardens; (c) forest; (d) urban centres of Monbulk and The Patch; (e) grazing and forest'. See Fig. 3 for explanation of symbols.

FIG. 8—Detailed land utilization, June 1962, of the NW. of the Silvan-Monbulk Region. Parts of predominant land use areas shown are: (a) 'forest and mixed', NW.; (b) 'market gardens and orchards', S. centre; (c) 'orchards and market gardens', E.; (d) 'grazing', NE.; (e) 'urban'. See Fig. 3 for explanation of symbols.

'freeze', and to a lesser extent the 1961 'eredit squeeze', have temporarily slowed or halted subdivision. In most cases subdivision has been earried out by private landowners rather than by real estate agents, as is the ease in other areas peripheral to Melbourne. Shire eouneils have been foreed to increase rates to meet growing demands for urban serviees, roads in partieular; grazing and general agrieulture have been most seriously affeeted in this regard; more intensive, higher-return land use is more resistant to sueh pressures. Property fragmentation has also allowed formerly eultivated, or at least eleared land, to revert to serub, blaekberries and braeken. On the other hand, it must be pointed out that sites most sought for modern homes, steep heavily wooded slopes overlooking some portion of the Dandenongs, are just those areas most avoided by agrieulture, intensive and extensive alike. The 'Ridge' area near The Pateh is one example of this tendency for urban utilization of otherwise virgin or little-used land (Fig. 7). Town serviees for the area as a whole are not really adequate, perhaps beeause of the proximity to Melbourne; also, the required 'population threshold' may not have been attained for many urban services.

TABLE 10

Evelyn County Data 1959-62

Evelyn County	1959-60	1960-61	1961-62	% change 1958-59 to 1961-62
Rural holdings	2,592	2,656	2,715	+ 4·75
No. of fruit growers	692	676	667	— 3·61
Fruit growing acreage	5,891	5,981	6,050	+ 2·69
FRUIT PRODUCTION—bushels:				
Apples	240,403	305,506	223,305	— 8·00
Canning pears	3,134	6,794	2,817	— 1·01 —58·52*
Other pears	47,132	45,356	62,282	+32·15
Canning peaches	3,652	4,666	5,655	+54·84
Other peaches	37,556	28,281	48,505	+29·16
Plums	42,127	26,487	54,022	+28·22
Cherries	72,833	57,446	103,866	+29·89
BERRY PRODUCTION—cwt:				
Strawberries	6,234	6,121	10,235	+64·18
Raspberries	2,813	2,574	2,873	+ 2·13
Loganberries	2,357	1,992	1,624	—31·10
Gooseberries	1,038	555	677	—34·77
Youngberries	3,755	4,069	4,532	+20·69
Other berries	1,504	615	759	—49·55
VEGETABLES—tons:				
Potatoes	21,938	16,531	16,015	—27·00
All other	5,917	5,941	8,746	+47·80
NURSERIES—acres:	809	797	888	+ 9·77
LIVESTOCK—total:				
Dairy cattle	24,821	23,959	25,548	+ 2·93
Beef cattle	16,616	19,522	21,084	+26·88
Horses	2,340	2,048	2,020	—13·68

* % change 1960-61 to 1961-62 season.

Trends in Production and Land Use

Many references have been made already in this paper to changes in areal distribution and intensity of farming, and Table 10 in part provides a summary of this material. As most of the figures in this table show production rather than acreages, seasonal fluctuations partly mask the trends. The figures (Comm. Bur. Cen. Stats Vict. 1958-62) refer to Evelyn County, which encompasses the area with which this report is concerned, and in most cases reveal trends parallel to those noted in the Silvan-Monbulk region.

Recommendations for Future Research

1. A study of the significance of environment (geology, soil, slope, vegetation, hydrology, etc.), country of origin, and labour demand, in settlement.
2. A detailed economic analysis of all types of farming to supplement the Bureau of Agricultural Economics Survey on berry fruit growing.
3. Comparable land use surveys in surrounding areas to establish the continuity or otherwise of patterns recognized by this report.
4. The role of service centres such as Mt Dandenong, Ringwood, Belgrave, Monbulk, and Lilydale.
5. Recording of climatic data for this area E. of the Dandenongs, and away from the Silvan Reservoir.

Conclusion

The Silvan-Monbulk region is characterized physically by inversion of relief, with basalt-capped ridges and lower dissected Silurian sediments, dry sclerophyll vegetation, and a climate wetter and cooler than Melbourne.

The land use pattern is an extremely varied one. Property acreage ranges from less than one acre to over 300 acres, and is closely related to geology and soil type, and hence to the intensity of utilization, ranging from extensive grazing through orcharding to market gardening and berry fruit growing. The larger the property and the more diversified the farm production, the more stable the economy of the individual holding; small-scale intensive agriculture appears to be in a somewhat depressed condition. Nevertheless, yields are above average in some sections with particularly suitable soil, or because of the artificial development of fertility, or with the introduction of, e.g. specially treated plants, bulbs, and runners.

Where labour is of importance, the problem is minimized by the use of unpaid family labour. Local factory and Melbourne markets are catered for by agents at a uniform but excessively high rate. Instability of prices and a widespread increase in competition are more serious economic problems, however, and on their resolution rests much of the future agricultural development of the area. Fortunately, strawberries, economically the most important crop in the Silvan area, have remained stable for many years.

Physical problems are being overcome or held in check with (a) the use of irrigation, natural springs, and damming; (b) the addition of phosphorus, nitrogen and, latterly, potassium; (c) non-use or immobilization of steeper sections of basalt soil; and (d) the increasingly successful attack on the virus diseases of berries in particular.

Finally, maximum use is yet to be made of the professional advice available to all farmers, and at present there is a close correlation between the frequent depression of intensive farming, inexperience of new farmers, and inadequacy of initial working capital.

Acknowledgement

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Explanation of Plate

Plate XLVI

Representative landscape in the 'market gardens and orchards' area E. of Silvan, Silvan-Monbulk Region. Note the varied land use, small holdings, numerous farm buildings and the micro-pattern of strips of different market garden crops. Photo: Lands and Survey: Melbourne Metropolitan 1960, 1096/80.